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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/001,317	10/23/2001	Michael Kowalchik	EMR-00401	2338

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EXAMINER	
CHACE, CHRISTIAN	

ART UNIT	PAPER NUMBER
2187	4

DATE MAILED: 11/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/001,317	KOWALCHIK ET AL.	
	Examiner	Art Unit	
	Christian P. Chace	2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

The Information Disclosure Statement filed 23 October 2001 has been considered by examiner. A signed and initialed copy is attached hereto.

Double Patenting

Copending applications 10/001,317 (instant) and 10/004,090 were found to have obviousness-type provisional double-patenting issues. 10/004,090 was found to have broader claims than the instant application.

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 4, 5, and 23 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 4, and 20, respectively, of copending Application No. 10/004,090. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 4 and 5 of the instant application anticipate respective claims 1 and 4 of the copending

application, and instant claim 23 is missing one limitation of copending application's claim 20, which is an obvious modification. All of this is explained below in detail.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

With respect to claims 4 and 5 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

Instant Application 10/001,317	**Application 10/004,090**
4. A cache comprising:	**1.** A data storage device, the device comprising:
A front-end interface	A device interface
That receives data access requests	For receiving data access requests
That specify respective data storage addresses	[inherent: any storage access request must specify an address, or location, of the data or area it wishes to access]
A back-end interface that can retrieve data identified by the data storage address	
Cache storage formed by at least two disks	More than two disk drives
Cache manager	A controller
That services at least some of the requests	That accesses the disk drives
Received at the front-end interface	In response to the received data access requests
Using data stored in the cache storage	[inherent: by accessing the disk drives, data stored in the disk drives is "used."]
Wherein the disks comprise disks having platters less than 3.5 inches in diameter	[disk drives] having platter sizes less than 3.5 inches in diameter
5. (depends upon claim 4, so contains all of the limitations supra)	**4.** (depends on claim 1, so contains all of the limitations supra)
Wherein the disks comprise disks having at least one of the following platter sizes: 2.5 inches, 1.8 inches, and 1 inch in diameter	Wherein the platter sizes comprise platters of at least one of the following sizes: 2.5 inches, 1.8 inches, and 1 inch

Claim 23 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 20 of copending Application No. 10/004090 in view of *Modern Operating Systems,* Tanenbaum, page 306 (cited in IDS filed 10/23/01 in both applications). As will be illustrated below in the table, the instant claim 23 would anticipate copending claim 20, with the exception of the at least one first data storage device having a platter size of at least 3.5 inches in diameter.

Instant Application 10/001,317	**Application 10/004,090**
23. A data storage system, comprising:	**20.** A data storage system, the system comprising:
A back-end storage system	At least one first data storage device
having an address space, addresses in the address space identifying blocks of storage	[inherent: storage systems must have addresses and addresses inherently identify blocks of storage, or storage locations]
[Obvious: see *Graham v. Deer* factors below]	Having a platter size of at least 3.5 inches in diameter
A cache for the back-end storage system	At least one second data storage device
Having a lesser storage capacity than the back-end system	[inherent: definition of a cache, i.e., smaller and faster memory for faster access closer to the processor]
The cache including:	Comprising:
A front-end interface	A device interface
That receives I/O requests	For receiving data access requests
That specify respective addresses of back-end storage blocks	[inherent as discussed supra]
A back-end interface	A second controller
That communicates with the back-end storage system	That coordinates data access to the at least one first data storage device and the at least one second storage device
Cache storage formed by at least two disks having platter diameters less than 3.5 inches	More than two disk drives coupled to the controller, the drivers having platter sizes less than 3.5 inches in diameter
A cache manager that services at least some of the I/O requests received via the front-end interface using blocks temporarily stored in the cache storage	A first controller configured to receive data access requests from the interface

However, Tanenbaum discloses that CD ROM's are 120 millimeters across, which is more than 3.5 inches, in the second paragraph of page 306.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, having the instant application and Tanenbaum before him/her, to have a back-end storage device (first data storage device) with platter sizes of at least 3.5 inches, as CD ROMS are at least 3.5 inches, and they have much higher recording densities than conventional magnetic disks, as disclosed by Tanenbaum in line 2 of the second paragraph on page 306.

This is a provisional obviousness-type double patenting rejection.

Specification

The attempt to incorporate subject matter into this application by reference to another copending patent application is improper because the serial number of said application is not included (see page 2 and page 8 of the instant specification).

The use of the trademark, "Infiniband," has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology. Although it is accompanied by other "protocols," applicants do not discuss what kind of protocols they are, *i.e.*, protocols for what?

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

The disclosure is objected to because of the following informalities:

Page 2, line 17 recites, "may platters." It appears a word is missing, such as –have--.

Page 3, lines 3-4 recite, "...requests that requests specify different respective data storage addresses..." does not make sense.

Page 4, line 11, for example, discusses, "...us[es]ing a collection of disks for cache storage instead of memory." Examiner wishes to note that disks *are* memory, as is any hardware that stores information. "Memory" is a very broad term that encompasses all forms of storage. Applicants appear to be using a different definition of memory which is inconsistent with its accepted meaning within the state of the art. Although the term, "memory" is not actually used in the claims, thereby avoiding a 35 USC 112, 2nd paragraph rejection, examiner wishes to point out the apparent oversight of the same type in the instant specification to avoid any possible future confusion by the general public should the instant application pass to issue. There are several other instances of the instant oversight throughout the specification.

Appropriate correction is required.

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Disk Based Disk Cache Interfacing System and Method."

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Brant et al (US Patent #5,805,787).

With respect to independent claim 1, a cache is disclosed in the title and abstract (#16 in figure 1). A cache is, by definition, a memory subsystem in which frequently used values are duplicated for quick access. A cache stores the contents of frequently accessed main memory locations and the addresses where these data items are stored in the main memory. A cache is useful between a processor and a main memory when main memory accesses are slow compared to the processor speed, because the cache memory is always faster than the main memory.

A front-end interface is disclosed in figure 1, #11, as the "host interface" in column 6, line 17.

A back-end interface is disclosed in figure 1 as #24, as the "interface to the mass data storage subsystem" in column 6, line 18.

Cache storage being formed by at least two disks is disclosed in figure 1, #16, and discussed in the abstract, for example.

A cache manager is disclosed as the storage controller in figure 1, #20. As discussed in column 4, lines 9-19, the storage controller receives data access requests

(via front-end interface #11) that specify respective data storage addresses, retrieves data identified by the data storage addresses, and services "at least some" of the requests received at the front-end interface using data stored in the cache storage. The "at least some" of the requests serviced are, of course, the ones in which the cache holds the information for. As the definition of cache suggests, as discussed supra, if the cache does not have the information, the cache does not service the request *per se*, but the main memory, or larger storage does (via back-end interface #24). This is also discussed in column 4, lines 9-19.

With respect to claims 2 and 15, the front-end interface comprising an interface conforming to "a protocol" is disclosed in column 6, lines 39-41, for example, where the protocol is a "SCSI-type connection[s].".

With respect to claims 3 and 16, the protocol comprising at least one of SCSI, Fibre Channel, "Infiniband," and IDE is disclosed in column 6, line 22, which identifies IDE, as well as line 41, which identifies SCSI and associates SCSI with the front-end interface (host interface #11).

With respect to claim 4, the disks comprising disks having platters less than 3.5 inches in diameter is disclosed in column 3, lines 44-46.

With respect to claim 5, the disks comprising disks having at least one of the following platter sizes: 2.5 inches, 1.8 inches, and 1 inch in diameter is disclosed in column 3, lines 44-46, which not only discloses the 1.8 inch diameter disk, but also states that "(or smaller)" [would work in the invention]. "Or smaller" would include the 1 inch diameter as well.

With respect to claims 6 and 19, the cache implementing a RAID scheme using the disks is disclosed in column 5, lines 34, 36, and 44, in general. RAID stands for, "Redundant Array of Independent Disks." In this case, column 5, line 59 recites, "Controller 20 can include independent paths to write data to its memory in a mirrored fashion." Mirroring is redundant storage of data. The cache being an Array is disclosed in column 4, line 15, for example. Figure 1 clearly shows separate disks, and, therefore, independent disks. Therefore, RAID is explicitly disclosed embodied in the invention of Brant et al.

With respect to claim 7, the cache performing at least one of the following operations is disclosed below. Examiner reminds applicants that as the claim language stands, only one of the following limitations are required to be anticipated by the instant prior art of record. However, it happens that all of the following limitations are anticipated by the cited prior art of record as follows:

Requesting data from a back-end storage system (see column 6, lines 50-51);

Retrieving requested data from the [at least two] disks [making up the cache] (see column 4, lines 9-19);

Sending data to the back-end system for writing (column 6,lines 50-51);

Determining the location of back-end system data within the [at least two] disks [making up the cache] (column 4, lines 32-48).

Removing data from the [at least two] disks [making up the cache] (column 4, lines 42-44).

With respect to claim 8, the addresses specifying storage locations of a back-end storage system that includes a collection of one or more disks is disclosed in the definition of a cache, discussed supra, in that, "A cache stores the contents of frequently accessed main memory locations and the addresses where these data items are stored in the main memory." The back-end storage system is the main memory. The back-end storage system comprising a collection of one or more disks is disclosed in figure 1, #25 and further discussed in column 6, lines 57-58, for example.

With respect to claim 9, the requests comprising I/O requests is disclosed in column 5, line 35, which refers to I/O rates. An I/O rate must be calculated from I/O requests. Therefore, I/O requests are inherent in a system with an I/O rate being measured. Also, it is important to note that I/O is "Input/Output," which is defined as the complementary tasks of gathering data for a computer or program to work with, and of making the results of the computer's activities available to the user or to other computer processes. This is exactly what figure 1 shows – data is gathered from the disk-based disk cache and supplied to the host.

With respect to claims 10 and 21, the data storage addresses comprising data storage addresses within an address space is inherent by definition of an address, which merely denotes a location of memory in which something is, or may be, stored. The address space is the disk-based disk cache.

With respect to claims 11 and 22, the address space comprising an address space of back-end storage is disclosed by the definition of a cache, as discussed with respect to claims 1 and 8, for example.

With respect to claim 12, a storage hierarchy associated with the various contemporary storage configurations, in order of accessing speed, in column 5, lines 10-28. Column 5, lines 29-31, recites that, "A storage subsystem that has the MB cost of disk coupled with the performance of many disks operated in parallel can fill several intermediate slots in this hierarchy." By introducing the storage subsystem at another slot of the hierarchy that has a level below it of slower access storage, the subsystem effectively becomes another cache, and it's respective address space becomes another cache's address space. An example of another level of memory that would have a slower access time might be a tape library or the like.

With respect to claim 13, the cache storage having more than one disk spindle is inherent in a duplex mirrored disk subsystem, which is disclosed in column 3, line 1. A disk spindle is an axle for mounting a disk. A duplex disk subsystem is a system of two spindles, one of which is active while the other remains on standby, ready to take over processing if the active spindle malfunctions.

With respect to independent claim 14, receiving data access requests at the cache is disclosed in column 4, lines 32-41.

The cache having storage formed by at least two disks is disclosed in figure 1, #16, and discussed in the abstract, for example.

The requests specifying respective data storage addresses is disclosed in the title and abstract. A cache is, by definition, a memory subsystem in which frequently used values are duplicated for quick access. A cache stores the contents of frequently accessed main memory locations and the addresses where these data items are stored

in the main memory. A cache is useful between a processor and a main memory when main memory accesses are slow compared to the processor speed, because the cache memory is always faster than the main memory.

As discussed in column 4, lines 9-19, the storage controller receives data access requests (via front-end interface #11) that specify respective data storage addresses, retrieves data identified by the data storage addresses, and services "at least some" of the requests received at the front-end interface using data stored in the cache storage. The "at least some" of the requests serviced are, of course, the ones in which the cache holds the information for. As the definition of cache suggests, as discussed supra, if the cache does not have the information, the cache does not service the request *per se*, but the main memory, or larger storage does (via back-end interface #24). This is also discussed in column 4, lines 9-19.

With respect to claim 17, the requests comprising at least one read request is disclosed in column 4, line 25, for example.

With respect to claim 18, servicing the requests comprising retrieving data from the back-end storage (main memory) and storing the data in at least one of the disks is inherent in the definition of caching. The addresses specifying storage locations of a back-end storage system that includes a collection of one or more disks is disclosed in the definition of a cache, discussed supra, in that, "A cache stores the contents of frequently accessed main memory locations and the addresses where these data items are stored in the main memory." The back-end storage system is the main memory.

The back-end storage system comprising a collection of one or more disks is disclosed in figure 1, #25 and further discussed in column 6, lines 57-58, for example.

With respect to claim 20, servicing the requests comprising determining whether the collection of disks currently stores the requested data is disclosed in column 4, lines 39-41, for example.

With respect to independent claim 23, a data storage system is disclosed in figure 1.

A 'back-end' storage system is disclosed in figure 1, #25. Data storage spaces all have addresses, or locations for storing data – this is inherent, by definition of an address and by definition of data storage. The addresses identifying "blocks" of storage is also inherent – a block of storage may be any size, as applicants have not limited such size in the instant claim. Therefore, examiner interprets a "block" to be one memory location.

A cache for the back-end storage system is disclosed in figure 1 as #16 as well as in the title and abstract. A cache is, by definition, a memory subsystem in which frequently used values are duplicated for quick access. A cache stores the contents of frequently accessed main memory locations and the addresses where these data items are stored in the main memory. A cache is useful between a processor and a main memory when main memory accesses are slow compared to the processor speed, because the cache memory is always faster than the main memory.

A front-end interface is disclosed in figure 1, #11, as the "host interface" in column 6, line 17. Receiving I/O requests that specify respective addresses of back-

end storage blocks is disclosed in column 5, line 35, which refers to I/O rates. An I/O rate must be calculated from I/O requests. Therefore, I/O requests are inherent in a system with an I/O rate being measured. Also, it is important to note that I/O is "Input/Output," which is defined as the complementary tasks of gathering data for a computer or program to work with, and of making the results of the computer's activities available to the user or to other computer processes. This is exactly what figure 1 shows – data is gathered from the disk-based disk cache and supplied to the host.

A back-end interface is disclosed in figure 1 as #24, as the "interface to the mass data storage subsystem" in column 6, line 18.

Cache storage being formed by at least two disks is disclosed in figure 1, #16, and discussed in the abstract, for example. The disks having platter diameters [of] less than 3.5 inches is disclosed in column 3, lines 45-46.

A cache manager is disclosed as the storage controller in figure 1, #20. As discussed in column 4, lines 9-19, the storage controller receives data access requests (via front-end interface #11) that specify respective data storage addresses, retrieves data identified by the data storage addresses, and services "at least some" of the I/O requests received at the front-end interface using data stored in the cache storage. The "at least some" of the requests serviced are, of course, the ones in which the cache holds the information for. As the definition of cache suggests, as discussed supra, if the cache does not have the information, the cache does not service the request *per se*, but the main memory, or larger storage does (via back-end interface #24). This is also discussed in column 4, lines 9-19.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US Patent #5,805,787 – Cited and discussed supra with respect to the claims

US Patent #5,933,853 – Multi-level cache hierarchy including a cache HDD

US Patent #6,101,576 – Disk cache

US Patent #6,389,510 – Disk cache in an internet environment

US Patent #5,911,779 – Copy-back disk cache

US Patent #5,787,466 – Multi-tier cache and method of implementing

US Patent #5,754,888 – Cache disk destaging

US Patent #5,721,956 – Network cache disk with multiple hierarchy

US Patent #5,890,207 – Same as instant invention, except that the cache is not at least two disks

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian P. Chace whose telephone number is 703.306.5903. The examiner can normally be reached on 9-4-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on 703.308.1756. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703.305.3900.

Christian P. Chace